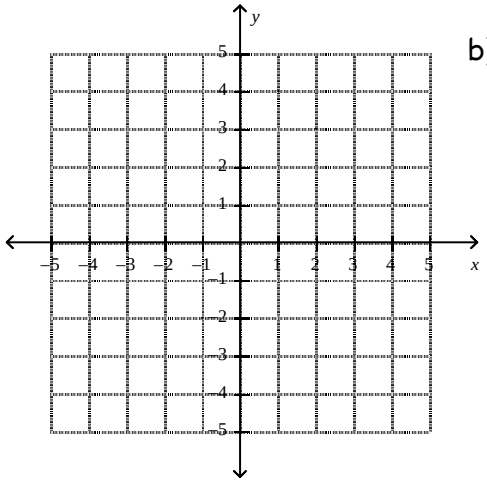
MPM2D **5.4 Zeros of Quadratic Relations** **Date: _____**

Intro: Graph the following functions using a table of values.

a) $y = x^2 - 3x + 2$

X	Y
3	
2	
1	
0	
-1	



Factor the above

b) $y = -x^2 - 2x + 3$

X	Y
1	
0	
-1	
-2	
-3	

Factor the above

What do you notice about the x-intercepts?

The factored form of a quadratic relation is $y = a(x-s)(x-t)$, where $a \neq 0$

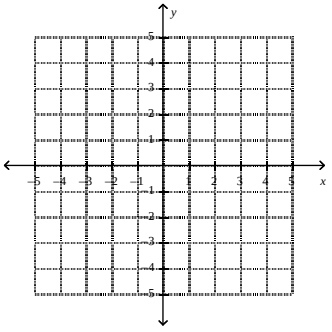
If $a > 0$, the parabola opens up and has a minimum.

If $a < 0$, the parabola opens down and has a maximum.

The zeros of $y = a(x-s)(x-t)$ are the x-intercepts of the graph and occur when $y = 0$, $\therefore x = s$ and $\therefore x = t$.

If $\therefore s \neq t$ there are **two** roots.

If $\therefore s = t$ there is only **one** root (and it is the vertex)



Given the zeros of a quadratic function the x coordinate of the vertex can be found by averaging the zeros. $x = \frac{s+t}{2}$ (also the equation of the axis of symmetry). The y value of the vertex can be found by _____.

When the zeros are known, "a" can be found by substituting another point (x,y) into the factored form of the equation.

Complete the following chart

	Zeros	Coordinates of the vertex	Axis of Symmetry	Sketch
1) $y = -x^2 - 6x$				
2) $y = 2x^2 - 16x + 32$				
3) $y = x^2 - 9$				

Problem Solving:

1. State the equation of the quadratic in factored form with zeros -1, -5 and y-intercept 3.

2. When a ball is kicked with a vertical speed of 20m/s its height, h, in metres, after t, in seconds, is given by the equation $h = -5t^2 + 20t$.
   a. How long after it is kicked is the football at the height of 15m?
   b. How long is the football in the air?